

Boolean Searching on the Internet

A Primer in Boolean Logic

Boolean logic allows you to combine words and phrases into search statements to retrieve documents from searchable databases. This tutorial will show you how to utilize Boolean logic to search the Internet.

The Internet is a vast computer database. As such, its contents must be searched according to the rules of computer database searching. Much database searching is based on the principles of Boolean logic. Boolean logic refers to the logical relationship among search terms, and is named for the British-born Irish mathematician George Boole.

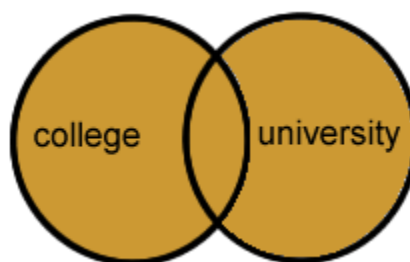
On Internet search engines, the options for constructing logical relationships among search terms often modify the traditional practice of Boolean searching. This will be covered in the section below, [Boolean Searching on the Internet.](#)

Boolean logic consists of three logical operators:

- **OR**
- **AND**
- **NOT**

Each operator can be visually described by using Venn diagrams, as shown below.

OR logic



college **OR** university

Question: I would like information about college.

- In this search, we will retrieve records in which AT LEAST ONE of the search terms is present. We are searching on the terms **college** and also **university** since documents containing either of these words might be relevant.
- This is illustrated by:

- the shaded circle with the word **college** representing all the records that contain the word "college"
- the shaded circle with the word **university** representing all the records that contain the word "university"
- the shaded overlap area representing all the records that contain both "college" and "university"

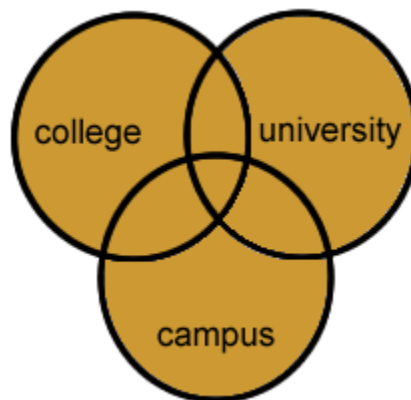
OR logic is most commonly used to search for synonymous terms or concepts.

Here is an example of how **OR** logic works:

Search terms	Results
college	396,482
university	590,791
college OR university	819,214

OR logic collates the results to retrieve all the unique records containing one term, the other term, or both of them.

The *more* terms or concepts we combine in a search with **OR** logic, the *more* results we will retrieve.



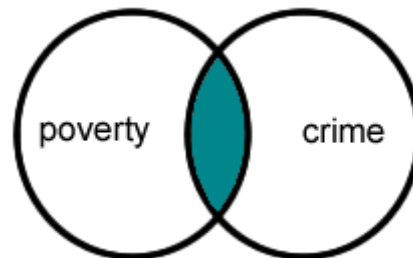
college OR university OR campus

For example:

Search terms	Results
college	396,482
university	590,791

college OR university	819,214
college OR university OR campus	929,677

AND logic



poverty **AND** crime

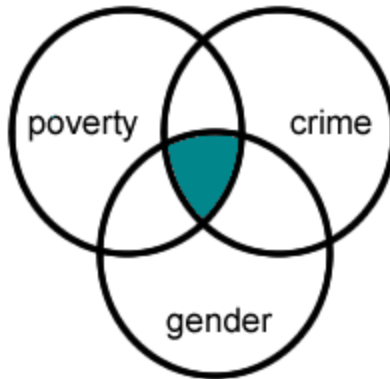
Question: I'm interested in the relationship between poverty and crime.

- In this search, we retrieve records in which BOTH of the search terms are present
- This is illustrated by the shaded area overlapping the two circles representing all the records that contain both the word "poverty" and the word "crime"
- Notice how we do not retrieve any records with only "poverty" or only "crime"

Here is an example of how **AND** logic works:

Search terms	Results
poverty	76,342
crime	348,252
poverty AND crime	12,998

The *more* terms or concepts we combine in a search with **AND** logic, the *fewer* results we will retrieve.

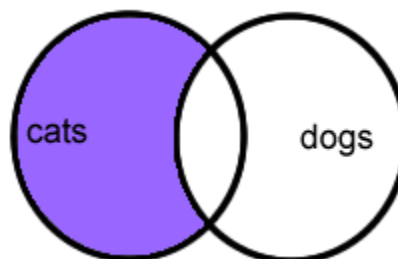


poverty AND crime AND gender

For example:

Search terms	Results
poverty	76,342
crime	348,252
poverty AND crime	12,998
poverty AND crime AND gender	1,220

NOT logic



cats NOT dogs

Question: I want information about cats, but I don't want to see anything about dogs.

- In this search, we retrieve records in which ONLY ONE of the terms is present, the one we have selected by our search
- This is illustrated by the shaded area with the word **cats** representing all the records containing the word "cats"
- No records are retrieved in the area overlapping the two circles where the word "dogs" appears, even if the word "cats" appears there too

Here is an example of how **NOT** logic works:

Search terms	Results
cats	86,747
dogs	130,424
cats NOT dogs	65,223

NOT logic excludes records from your search results. Be careful when you use **NOT**: the term you do want may be present in an important way in documents that also contain the word you wish to avoid. For example, consider a Web page that includes the statement that " cats are smarter than dogs." The search illustrated above would exclude this document from your results.

Combined **AND** and **OR** logic

Question: I want information about the behavior of cats.

Search: behavior **AND** (cats **OR** felines)

You can combine both **AND** and **OR** logic in a single search, as shown above.

The use of parentheses in this search is known as **FORCING THE ORDER OF PROCESSING**. In this case, we surround the **OR** words with parentheses so that the search engine will process the two related terms as a unit. The search engine will use **AND** logic to combine this result with the second concept. Using this method, we are assured that the semantically-related **OR** terms are kept together as a logical unit.

Boolean Searching on the Internet

When you use an Internet search engine, the use of Boolean logic may be manifested in three distinct ways:

1. Full Boolean logic with the use of the logical operators
2. Implied Boolean logic with keyword searching
3. Boolean logic using search form terminology

1. Full Boolean logic with the use of the logical operators

This is classic Boolean searching. However, few search engines nowadays offer the option to do full Boolean searching with the use of the logical operators. It is more common for them to offer simpler

methods of constructing search statements, specifically implied Boolean logic and search form terminology. These methods are covered below.

If you want to construct searches using Boolean logical operators, you will need to experiment with search engines and see what happens. You can try some of the search statements shown below. Keep in mind that the search engine might require that the Boolean operators be typed in CAPITAL LETTERS. Don't forget that most search engines provide help pages that explain the kind of searching you can do on their sites.

Question: I need information about cats.

Boolean logic: OR

Search: cats OR felines

Question: I'm interested in dyslexia in adults.

Boolean logic: AND

Search: dyslexia AND adults

Question: I'm interested in radiation, but not nuclear radiation.

Boolean logic: NOT

Search: radiation NOT nuclear

Question: I want to learn about cat behavior.

Boolean logic: AND, OR

Search: behavior cats OR felines

The last example is a tricky search on most search engines. It combines implied AND logic - designated by the space between the word "behavior" and "cats" - with the use of the Boolean OR operator. You can give this search a try, but the search engine might not process it as you intended. The safest way to conduct this type of search is to use the advanced search page available on most search engine sites. This will be shown in option #3 below (search form terminology).

2. Implied Boolean logic with keyword searching

KEYWORD SEARCHING refers to a search type in which you enter words in a search box representing the concepts you wish to retrieve. Boolean operators are not used.

IMPLIED BOOLEAN LOGIC refers to a search in which symbols are used to represent Boolean logical operators. In this type of search, the *absence* of a symbol is also significant, as the space between keywords defaults to either **OR** logic or **AND** logic.

Nowadays, virtually all general search engines on the Web default to **AND** logic. In other words, when you type words into a search box and generate your search, Boolean **AND** logic is going on behind the scenes.

Implied Boolean logic is so common on Web search engines that it can be considered a de facto standard.

Question: I need information about cats.

Boolean logic: **OR**

Search: [no implied Boolean logic is available]

There are probably no general search engines on the Web that interpret the space between keywords as the Boolean **OR**. Rather, the space between keywords is interpreted as **AND**. To do an **OR** search, choose either option #1 above (full Boolean logic) or option #3 below (search form terminology).

Question: I'm interested in dyslexia in adults.

Boolean logic: **AND**

Search: dyslexia adults

Question: I'm interested in radiation, but not nuclear radiation.

Boolean logic: **NOT**

Search: radiation -nuclear

Notice the minus sign (-) in front of the word "nuclear".

Question: I want to learn about cat behavior.

Boolean logic: **AND**, **OR**

Search: [no implied Boolean logic is available]

3. Boolean logic using search form terminology

Many search engines offer an advanced search page with a search form which allows you to choose the Boolean operators from a menu. Usually the logical operator is expressed with substitute terminology rather than with the operator itself.

Question: I need information about cats

Boolean logic: OR

Search: Any of the words/At least one of the words/Should contain the words

Question: I'm interested in dyslexia in adults.

Boolean logic: AND

Search: All of these words/Must contain the words

Question: I'm interested in radiation, but not nuclear radiation.

Boolean logic: NOT

Search: Must not contain the words/Should not contain the words

Question: I want to learn about cat behavior.

Boolean logic: AND, OR

Search: Combine options if the form allows multiple search logic, as in the example below.

Find pages with...

all these words:

behavior

this exact word or phrase:

any of these words:

cats felines

Quick Comparison Chart:

Full Boolean vs. Implied Boolean vs. Search Form

	Full Boolean	Implied Boolean	Search Form Terminology
OR	college OR university	[rarely available]	any of the words at least one of the words should contain the words
AND	poverty AND crime	poverty crime	all of these words must contain the words
NOT	cats NOT dogs	cats -dogs	must not contain the words should not contain the words